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ABSTRACT

The purpose of this investigation was: (1) to determine whether the hypothesized properties of the Structure of Intellect Tests could be found to hold for college freshmen, and (2) to determine the relationship with two standardized marker tests. A total of ten Structure of Intellect Tests, the Cooperative Reading Comprehension Test, and the School and College Ability Test were given to approximately 600 Kent State University freshmen during their Precollege Conference during the summer of 1968. The fall Grade Point Average (GPA) was obtained during the next term. Product-moment correlations were computed among all variables. Of the 10 Structure of Intellect Tests, five were found to be significantly correlated at the .05 level. These same five selected abilities measures were correlated with the scales from the two marker tests and fall term GPA. The statistical properties of the scale scores and the student reaction to tests themselves indicate these tests may be applicable to college freshmen. (Author)

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TEN STRUCTURE-OF-INTELLECT TESTS AND THEIR APPROPRIATENESS FOR COLLEGE FRESHMEN

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INTRODUCTION

From a multidimensional point of view J.P. Guilford and associates have developed a theoretical model to explain the component parts of "intelligence". The Structure-of-Intellect Model hypothesizes some 120 distinct testable abilities for which approximately 90 tests have been developed to measure them. The existing tests, however, were developed on specific samples, thus limiting the generalization of the findings. Hence this study is interested in investigating the appropriateness of specific ability tests for use with college freshmen.

Guilford defines each of the 120 distinct abilities by a 3-dimensional cube each dimension of which stands for an operation, a content, and a product. Verbal Comprehension (cmu), for example, is defined as the Cognition (c),-operation, of semantic (m)-content, units (u)-product. Each of the 120 abilities hypothesized is orthogonal in theory, but previous research has shown that the orthogonality of the tests is a function of the sample used.

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In the following study 10 tests were chosen from the Structure-of-Intellect Model along with two marker tests, the Cooperative Reading Test and the School and College Ability Test. The purpose of the study being twofold: 1) to determine whether or not the 10 Selected Ability tests remain orthogonal for the particular ability level of the sample, college freshmen and 2) to determine the relationship that exists between the selected ability tests and the two standardized marker tests.

METHOD

Ten ability tests were selected from the Structure-of-Intellect Model on the basis that their measures represented some of the different abilities required in different course areas. The ten tests selected were Verbal Comprehension (CMU), Memory for Letter Series (MSR), Problem Solving (CMS), Figure Analogies (CFR), Verbal Analogies (CMR), Form Reasoning (NSI), Unlikely Things (EMS), Associations III (NMR), Picture Memory (MMU), and Sequential Associations (NMI). The Cooperative Reading Comprehension Test, and the School and College Ability Test were selected as marker tests or measures of concurrent validity since they were traditional predictors of grade point average, GPA, and had established norms. Refer to Table 1 for a list of scales used in this study.

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Insert Table 1 about here

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The sample of approximately 600 was chosen by a stratified random procedure from the students attending the Precollege Conference at Kent State University during the summer, 1968. Thus, the sample consisted of a representative group of fall freshmen.

The sample was broken into several subgroups each of which was administered some combination of the scales listed in Table 1. Since the test administration had to work around the Precollege Conference activities the subsample sizes were not constant.

The means, standard deviations, and frequency distributions of responses were computed for each of the fifteen scales. Then product-moment correlations were computed between each of the paired scales. However, it should be noted that it was not possible to obtain all combinations of paired scales. Refer to Table 2 for the scale intercorrelations.

RESULTS

From the scale statistics, in particular from the frequency distributions, the scales appeared to be of appropriate level for college freshman. In general, the distributions were symmetric and dispersed across the scale range. Although the selected ability tests are not of the traditional content for the most part, the students did not object or react objectionably to these tests. Thus, from a technical standpoint the tests could be used with college freshmen. These writers recommend, however, that the format and style be updated before being used.

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Insert Table 2 about here

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From Table 2 it can be seen that several of the ten selected ability tests from the Structure-of-Intellect Model were intercorrelated. Figural Analogies (CFR) had significant, at the α=.05 level, correlations with Problem Solving (CMS), Verbal analogies (CMR), Form Reasoning (NSI), Verbal Comprehension (CMU), and Memories for Letter Series (MSR). Verbal Analogies (CMR) had the next highest number of correlates; it correlated with Figural Analogies (CFR), Verbal Comprehension (CMU), Problem Solving (CMS), and Unlikely Things (EMS). From Table 2 and the above it is evident that Figure Analogies (CFR) and Verbal Analogies (CMR) seem to be the basis for most of these relationships.

Although it was not possible to obtain all pairs of correlates in this investigation, it should be noted that in a similar study with a larger sample Ferrara (1970) found similar patterns as above. Also, in this study Ferrara found that Associations III (NMR) had significant correlations with the same variables as Verbal Analogies (CMR) stated above.

Further analysis of Table 2 indicates that the School and College Ability Test scales correlate highly with those of the Cooperative Reading Comprehension Test. The correlations were all significant at the α=.01 level.

The Coop Reading and SCAT, the two marker tests, were significantly correlated with the same selected ability test scales that were found to be intercorrelated with each other. The three subscales of the Coop Reading were found to be significantly correlated with Verbal Comprehension (CMU, verbal

Analogies (CMR), Figural Analogies (CFR), Form Reasoning (NSI), and Problem Solving (CMS). The SCAT subscales were correlated with Associations III (NMR). It should be noted that the Coop Reading and SCAT subscales were not paired with all of the ten selected ability test scales.

DISCUSSION

From the results it appears that the independence of the ten selected Structure-of-Intellect Tests is not supported by this sample's performance. However, it may be that the correlations among these 10 scales averaged r=.198, which is a moderately low correlation. Nevertheless, correlations significant at the α=.05 level were found among five of these ten tests. It should be noted that the relationship between any pair of these five tests could be a function of a common general factor which is reflected by the pair. For example, Verbal Comprehension (CMU) correlates r=.491 with Problem Solving (CMS). This relationship may be due to the fact that both tests have CM- in common, i.e., the operation of cognition (C) and the semantic content (M) are contained in both. In conclusion, the orthoganality of the factor tests was relatively maintained.

The moderately high correlations among the scales of the Coop Reading and SCAT tests, the average r=.583, was not unexpected since these are both highly verbal tests. The correlations between the ten selected abilities scales and the five marker test scales indicate that certain ability scales correlate with specific scales from the marker tests but not with others. It

is interesting to find that again the same five selected abilities tests turn out to have the significant correlations.

Although it is beyond the scope of this study to go into the details of academic performance correlates (see Ferrara, 1970), a follow up of this sample indicated that again the same selected abilities measures were correlated with grade point average. Thus, Verbal Comprehension (CMU), Verbal Analogies (CMR), Figural Analogies (CFR), Associations III (NMR), and Problem Solving (CMS) were correlated with academic performance as well as with the five marker test scales.

An analysis of these five selected ability tests, (CMU), (CMR), (CFR), (NMR), and (CMS) indicates that four of the five tests have cognition as its operation according to the Guilford Model. Also, four of the five tests have semantic as the content and three of the five have relations as the product. Hence, the correlations found in this study may be attributed to the common properties inherent in these scales.

SUMMARY

The Structure-of-Intellect Model hypothesizes 120 distinct abilities. The tests which have been developed have been developed on specific samples. The purpose of this investigation was to (1) determine whether the hypothesized properties of the Structure-of-Intellect Tests could be found to hold for college freshmen, and (2) to determine the relationship with two standardized marker tests.

Ten Structure-of-Intellect Tests, the Cooperative Reading Comprehension Test, and the School and College Ability Test were given to approximately 600 Kent State University freshmen

during their Precollege Conference during the summer of 1968. The fall GPA was obtained during the next term. Product-moment correlations were computed among all variables.

Five of the ten Structure-of-Intellect Tests were found to be significantly correlated at the $\alpha=.05$ level. These same five selected abilities measures were correlated with the scales from the two marker tests and fall term GPA. These intercorrelations may be due to the common dimensions of (cognitive-semantic-relations) according to the Guilford Model.

In conclusion, the statistical properties of the scale scores and the student reaction to tests themselves indicate these tests may be applicable to college freshmen.

TABLE 1

SCALES USED IN THE STUDY

I. Ten Selected Ability Tests
   1-Verbal Comprehension (CMU) - Cognition of Semantic Units
   2-Memory for Letter Series (MSR) - Memory of Symbolic Relations
   3-Problem Solving (CMS) - Cognition of Semantic Systems
   4-Figure Analogies (CFR) - Cognition of Figural Relations
   5-Verbal Analogies (CMR) - Cognition of Semantic Relations
   6-Form Reasoning (NSI) - Convergent Production of Symbolic Implication
   7-Unlikely Things (EMS) - Evaluation of Semantic Systems
   8-Associations III (NMR) - Convergent Production of Semantic Relations
   9-Picture Memory (MMU) - Memory of Semantic Units
   10-Sequential Associations (NMI)-Convergent Production of Semantic Implications

II. School and College Ability Test (SCAT)
   11-Verbal
   12-Quantitative

III. Cooperative Reading Comprehension Test
   13-Vocabulary
   14-Level of Comprehension
   15-Speed of Comprehension

Table 2

Intercorrelations Between Ten Selected Ability Tests, SCAT, and Coop Reading Test which are Significant at the α=.05

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Verb Comp (CMU)				.288	.351	.324	-.003						.672	.478	.546
2. Mem Lett (MSR)				.201											
3. Prob Solv (CMS)				.491	.288									.241	.292
4. Fig Anal (CFR)					.457	.340							.349	.452	.371
5. Verb Anal (CMR)		132					.216						.442	.436	.293
6. Form Reas. (NSI)													.245	.349	.306
7. Unlk Thngs (EMS)															
8. Asso. III (NMR)									.171	.210	.553	.247			
9. Pict. Mem (MMU)								242							
10. Seq. Asso. (NMI)											.173				
11. SCAT verb												.412	.866	.765	.571
12. SCAT Qunt.								68			81		.446	.429	.444
13. RC Voc.														.703	.624
14. RC level			105												.572
15. RC speed											68		73		

Note: The numbers which appear above the diagonal are correlations significant at α=.05 level
Note: The numbers which appear below the diagonal indicate the smallest N in that region which was used in the test of significance
Note: Shaded areas indicate that data was not obtained to compute these correlations

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